

WHAT IS CLAIMED IS:

1. A method for reacting at least one primary and/or secondary alkanolamine with at least one ester, optionally, in the presence of catalyst, to provide a reaction mixture containing hydroxyalkyl amide and unreacted alkanolamine, wherein the improvement comprises, carrying out the reaction of alkanolamine and ester in the presence of at least one metal silicate or treating the reaction mixture with at least one metal silicate, the metal of the metal silicate being a metal of Group IIA or Group IIIA of the Periodic Table.
2. The method of Claim 1 wherein the alkanolamine is of the general formula $RNHR'$ wherein R is hydroxyalkyl of from 2 to about 10 carbon, hydroxyalkyl ether and/or combinations thereof, and R' is hydrogen, alkyl of from 1 to about 10 carbon atoms, hydroxyalkylether combinations thereof or hydroxyalkyl of from 2 to about 10 carbon atoms, hydroxyalkylether and combinations thereof.
3. The method of Claim 2 wherein the alkanolamine is selected from the group consisting of ethanolamine, propanolamine, isopropanolamine, butanolamine, isobutanolamine, methylethanolamine, butylethanolamine, diethanolamine, dipropanolamine, diisopropanolamine, dibutanolamine, diisobutanolamine, and mixtures thereof.
4. The method of Claim 1 wherein the parent acid of the ester contains from about 4 to about 22 carbon atoms and the parent alkanol of the ester contains from 1 to about 10 carbon atoms.
5. The method of Claim 4 wherein the ester is a fatty acid methyl ester or mixture of fatty acid methyl esters.

6. The method of Claim 4 wherein the parent acid of the ester is a fatty acid derived from canola oil, castor oil, cocoa butter, coconut oil, cotton seed oil, olive oil, palm kernel oil, palm kernel (olein), palm kernel (stearine), peanut oil, rapeseed oil, safflower oil, soybean oil, sunflower oil, tall oil, corn oil, butter, lard, tallow, yellow grease, blubber, herring, menhaden, sardine oil, babasso oil and mixtures thereof.

7. The method of Claim 6 wherein the parent acid of the ester is a fatty acid derived from coconut oil and the parent alkanol of the ester is methanol.

8. The method of Claim 4 wherein the parent acid of the ester is selected from the group consisting of butyric, caproic, caprylic, capric, decenoic, lauric, cis-9-dodecenoic, myristic, myristoleic, cis-9-tetradecenoic, pentadecanoic, palmitic, palmitoleic, cis-9-hexadecenoic, heptadecanoic, heptadecenoic, steric, oleic, linoleic, linolenic, ricinoleic, dihydroxystearic, nonadecanoic, arachidic, cis-9, cis-11-eicosenoic, eicosadienoic, eicosatrienoic, arachidonic, eicosapentaenoic, behenic, erucic, docosadienoic, 4,8,12,15,19-docosapentaenoic, docosahexaenoic, lignoceric, tetracosenoic and mixtures thereof.

9. The method of Claim 8 wherein the parent alkanol of the ester is methanol.

10. The method of Claim 1 wherein the catalyst is a basic catalyst.

11. The method of Claim 10 wherein the basic catalyst is a metal alkoxide or carbonate.

12. The method of Claim 11 wherein the metal alkoxide or carbonate is selected from the group consisting of sodium methoxide, sodium ethoxide, sodium propoxide, potassium methoxide, potassium ethoxide, potassium propoxide, potassium

carbonate, sodium carbonate, sodium or potassium butoxide, sodium or potassium pentoxide, sodium or potassium hexanoate, sodium carbonate, potassium carbonate, cesium carbonate, calcium carbonate, strontium carbonate, barium carbonate and mixtures thereof.

5 13. The method of Claim 10 wherein the basic catalyst is an organic catalyst selected from the group consisting of tetraalkyl ammonium hydroxide, Ethyl diisopropyl amines, diisopropylethyl amines, 1,8-diazabicyclo[5.4.0] undec-7-ene, 1,5-diazabicyclo[4.3.0] non-5-ene, guanidine and penta methyl guanadine.

 14. The method of Claim 1 wherein the catalyst is present in an amount of
10 from about 1 to about 100 wt. percent of catalyst concentrate in solvent.

 15. The method of Claim 14 wherein the catalyst is present in an amount of from about 10 to about 50 wt. percent of catalyst concentrate in solvent.

 16. The method of Claim 15 wherein the catalyst is present in an amount of from about 20 to about 30 wt. percent of catalyst concentrate in solvent.

15 17. The method of Claim 12 wherein the metal alkoxide or carbonate catalyst is present in an amount of from about 0.05 to about 1.00 wt. percent.

 18. The method of Claim 17 wherein the metal alkoxide or carbonate catalyst is present in an amount of from about 0.25 to about 0.75 wt. percent.

 19. The method of Claim 18 wherein the metal alkoxide or carbonate catalyst
20 is present in an amount of from about 0.40 to about 0.60 wt. percent.

 20. The method of Claim 13 wherein the organic catalyst is present in an amount of from about 0.05 to about 1.00 wt. percent.

21. The method of Claim 20 wherein the organic catalyst is present in an amount of from about 0.25 to about 0.75 wt. percent.

22. The method of Claim 21 wherein the organic catalyst is present in an amount of from about 0.40 to about 0.60 wt. percent.

5 23. The method of Claim 1 wherein the metal silicate is of the general formula $xM_aO_b \cdot ySiO_2 \cdot zH_2O$ wherein M is any metal of Group IA, Group IIA or Group IIIA of The Periodic Table, x and y are in a molar ratio of from about 1.5:1 to about 1:3.6 and z is equal to x, a is 1 or 2 and b is 1-3.

10 24. The method of Claim 23 wherein in the formula of the metal silicate, x is 1, y is 2.6 and z is 1.

25. The method of Claim 23 wherein the metal in the metal silicate is magnesium, calcium, aluminum, sodium.

26. The method of Claim 24 wherein the metal in the metal silicate is magnesium, calcium, aluminum, sodium.

15 27. The method of Claim 23 wherein the metal silicate is present at a level of from about 1 to about 50 wt. percent of hydroxyalkyl amide reaction mixture.

28. The method of Claim 23 wherein the metal silicate is present at a level of from about 10 to about 20 wt. percent of hydroxyalkyl amide reaction mixture.

20 29. The method of Claim 24 wherein the metal silicate is present at a level of from about 1 to about 50 wt. percent of hydroxyalkyl amide reaction mixture.

30. The method of Claim 24 wherein the metal silicate is present at a level of from about 10 to about 20 wt. percent of hydroxyalkyl amide reaction mixture.

31. The method of Claim 1 wherein the reaction mixture treated with the metal silicate contains from about 0 to about 0.5 wt. percent unreacted alkanolamine.

32. The method of Claim 1 wherein the reaction mixture treated with the metal silicate contains from about 0.05 to about 0.2 wt. percent unreacted alkanolamine.

5 33. The method of Claim 1 wherein the reaction of alkanolamine and ester is carried out in the presence of catalyst and treated with metal silicate with the amount of catalyst being reduced by about 30 percent.

34. The method of Claim 1 wherein the reaction of alkanolamine and ester is carried out in the presence of catalyst and treated with metal silicate with the amount of
10 catalyst being reduced by about 60 percent.

35. A method for making a hydroxyalkyl amide which comprises reacting at least one primary and/or secondary alkanolamine with at least one ester, optionally, in the presence of catalyst, to provide a reaction mixture containing hydroxyalkyl amide and unreacted alkanolamine, the reaction of alkanolamine and ester being carried out in the
15 presence of at least one metal silicate or the reaction mixture being treated with at least one metal silicate, the metal of the metal silicate being a metal of Group IA, Group IIA or Group IIIA of the Periodic Table.

36. The method of Claim 35 wherein the primary and/or secondary alkanolamine is of the general formula $RNHR'$ wherein R is hydroxyalkyl of from about
20 2 to about 10 carbon atoms, hydroxyalkylether and/or combinations thereof, and R' is hydrogen, alkyl of from 1 to about 10 carbon atoms, hydroxyalkylether and/or combinations thereof or hydroxyalkyl of from 2 to about 10 carbon atoms, hydroxyalkylether and/or combinations thereof.

37. The method of Claim 35 wherein the alkanolamine is selected from the group consisting of ethanolamine, propanolamine, isopropanolamine, butanolamine, isobutanolamine, methylethanolamine, butylethanolamine, diethanolamine, dipropanolamine, diisopropanolamine, dibutanolamine, diisobutanolamine, and mixtures thereof.

38. The method of Claim 35 wherein the parent acid of the ester contains from about 4 to about 22 carbon atoms and the parent alkanol of the ester contains from 1 to about 10 carbon atoms.

39. The method of Claim 38 wherein the ester is a fatty acid methyl ester or mixture of fatty acid methyl esters.

40. The method of Claim 35 wherein the parent acid of the ester is a fatty acid derived from canola oil, castor oil, cocoa butter, coconut oil, cotton seed oil, olive oil, palm kernel oil, palm kernel (olein), palm kernel (stearine), peanut oil, rapeseed oil, safflower oil, soybean oil, sunflower oil, tall oil fatty acid, corn oil, butter, lard, tallow, yellow grease, blubber, herring, menhaden, sardine, babasso and mixtures thereof.

41. The method of Claim 40 wherein the parent acid of the ester is a fatty acid derived from coconut oil and the parent alkanol of the ester is methanol.

42. The method of Claim 38 wherein the parent acid of the ester is selected from the group consisting of butyric, caproic, caprylic, capric, decenoic, lauric, cis-9-dodecenoic, myristic, myristoleic, cis-9-tetradecenoic, pentadecanoic, palmitic, palmitoleic, cis-9-hexadecenoic, heptadecanoic, heptadecenoic, steric, oleic, linoleic, linolenic, ricinoleic, dihydroxystearic, nonadecanoic, arachidic, cis-9, cis-11-eicosenoic, eicosadienoic, eicosatrienoic, arachidonic, eicosapentaenoic, behenic, erucic,

docosadienoic, 4,8,12,15,19-docosapentaenoic, docosaheptaenoic, lignoceric, tetracosenoic and mixtures thereof.

43. The method of Claim 42 wherein the parent alkanol of the ester is methanol.

5 44. The method of Claim 38 wherein the catalyst is a basic catalyst.

45. The method of Claim 44 wherein the basic catalyst is a metal alkoxide or carbonate.

46. The method of Claim 45 wherein the metal alkoxide or carbonate is selected from the group consisting of sodium methoxide, sodium ethoxide, sodium propoxide, potassium methoxide, potassium ethoxide, potassium propoxide, potassium carbonate, sodium carbonate, sodium or potassium butoxide, sodium or potassium pentoxide, sodium or potassium hexanoate, sodium carbonate, potassium carbonate, cesium carbonate, calcium carbonate, strontium carbonate, barium carbonate and mixtures thereof.

10

15 47. The method of Claim 44 wherein the basic catalyst is an organic catalyst selected from the group consisting of tetraalkyl ammonium hydroxide, Ethyl diisopropyl amines, diisopropyl ethyl amines, 1,8-diazabicyclo[5.4.0]undec-7-ene, 1,5-diazabicyclo[4.3.0]non-5-ene, guanidine, penta methyl guanadine.

48. The method of Claim 35 wherein the catalyst is present in an amount of from about 1 to about 100 wt. percent of catalyst concentrate in solvent.

20

49. The method of Claim 48 wherein the catalyst is present in an amount of from about 10 to about 50 wt. percent of catalyst concentrate in solvent.

50. The method of Claim 49 wherein the catalyst is present in an amount of from about 20 to about 30 wt. percent of catalyst concentrate in solvent.

51. The method of Claim 46 wherein the metal alkoxide or carbonate catalyst is present in an amount of from about 0.05 to about 1.00 wt. percent.

5 52. The method of Claim 51 wherein the metal alkoxide or carbonate catalyst is present in an amount of from about 0.25 to about 0.75 wt. percent.

53. The method of Claim 52 wherein the metal alkoxide or carbonate catalyst is present in an amount of from about 0.40 to about 0.60 wt. percent.

54. The method of Claim 47 wherein the organic catalyst is present in an
10 amount of from about 0.05 to about 1.00 wt. percent.

55. The method of Claim 54 wherein the organic catalyst is present in an amount of from about 0.25 to about 0.75 wt. percent.

56. The method of Claim 55 wherein the organic catalyst is present in an amount of from about 0.40 to about 0.60 wt. percent.

15 57. The method of Claim 35 wherein the metal silicate is of the general formula $xM_aO_b \cdot ySiO_2 \cdot zH_2O$ wherein M is any metal of Group IA, Group IIA or Group IIIA of The Periodic Table, x and y are in a molar ratio of from about 1.5:1 to about 1:3.6 and z is equal to x, a is 1 or 2 and b is 1-3.

58. The method of Claim 57 wherein in the formula of the metal silicate x is 1,
20 y is 2.6 and z is 1.

59. The method of Claim 57 wherein the metal in the metal silicate is magnesium, calcium, aluminum, sodium.

60. The method of Claim 58 wherein the metal in the metal silicate is magnesium.

61. The method of Claim 57 wherein the metal silicate is present at a level of from about 1 to about 50 wt. percent of hydroxyalkyl amide reaction mixture.

5 62. The method of Claim 57 wherein the metal silicate is present at a level of from about 10 to about 20 wt. percent of hydroxyalkyl amide reaction mixture.

63. The method of Claim 58 wherein the metal silicate is present at a level of from about 1 to about 50 wt. percent of hydroxyalkyl amide reaction mixture.

10 64. The method of Claim 58 wherein the metal silicate is present at a level of from about 10 to about 20 wt. percent of hydroxyalkyl amide reaction mixture.

65. The method of Claim 35 wherein the hydroxyalkyl amide contains not more than about 0.5 wt. percent unreacted alkanolamine.

15 66. The method of Claim 35 wherein the reaction of alkanolamine and ester is carried out in the presence of catalyst and treated with metal silicate with the amount of catalyst being reduced by about 30 wt. percent.

67. The method of Claim 35 wherein the reaction of alkanolamine and ester is carried out in the presence of catalyst and treated with metal silicate with the amount of catalyst being reduced by about 60 wt. percent.

20 68. A method of making a liquid engine fuel or lubricant composition comprising a major amount of liquid hydrocarbon fuel or lubricant and a minor amount of a hydroxyalkyl amide composition containing hydroxyalkyl amide obtained from a primary and/or secondary alkanolamine, metal silicate and ester, the hydroxyalkyl amide containing less than 0.5 wt. percent of alkanolamine.

3

69. The method of making a liquid engine fuel or lubricant composition of Claim 68 comprising a major amount of liquid hydrocarbon fuel or lubricant and a minor amount of a hydroxyalkyl amide composition containing hydroxyalkyl amide obtained from a primary and/or secondary alkanolamine, metal silicate and ester, the hydroxyalkyl
5 amide containing less than 0.2 wt. percent of alkanolamine.

70. The method of making a liquid engine fuel or lubricant composition of Claim 68 comprising a major amount of liquid hydrocarbon fuel or lubricant and a minor amount of a hydroxyalkyl amide composition containing hydroxyalkyl amide obtained from a primary and/or secondary alkanolamine, metal silicate and ester, the hydroxyalkyl
10 amide containing less than 0.1 wt. percent of alkanolamine.